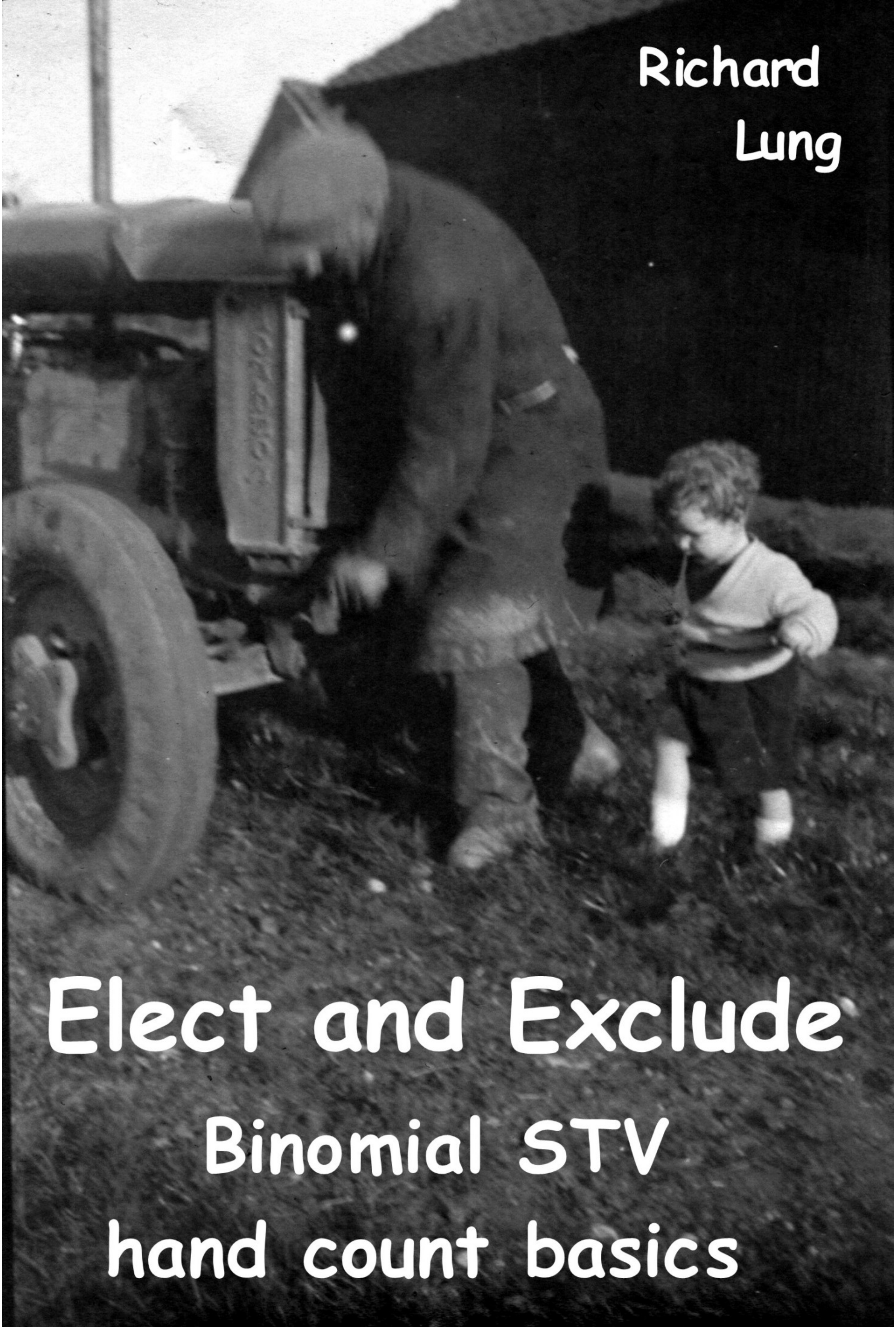
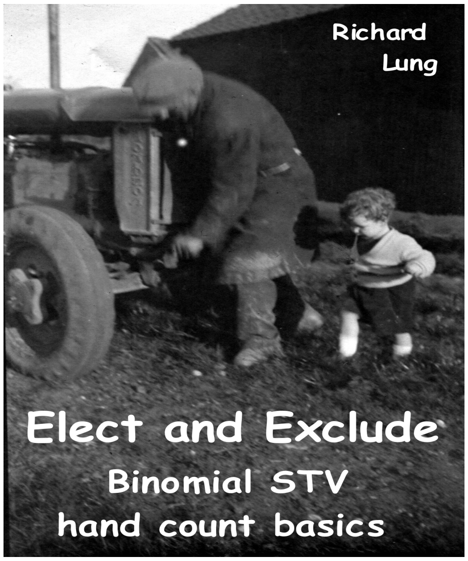


Richard
Lung

Elect and Exclude

Binomial STV
hand count basics



Elect and Exclude.

Binomial STV hand count basics.

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First edition.

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Introduction

Power corrupts and absolute power corrupts absolutely, as Lord Acton said. Monopoly power, principally of the state, even in civilised countries, can grieviously oppress the innocent.

No man is good enough to be another mans master, as William Morris said.

Binomial STV has the unique property, among voting systems, of being able to exclude, as well as elect candidates. It promotes friends and helpers. It can also remove masters and oppressors.

I have already written a booklet on this subject – “The Super-Vote supercharged. Binomial STV elections Hand Count.”

I wrote that, when I realised that binomial STV could be popularised, as a hand count, in any local club elections.

Previously, I thought of Binomial STV as a grand logical structure, capable only of a computer count. I wrote a full-scale book about this – “FAB STV: Four Averages Binomial Single Transferable Vote.” FAB STV has higher orders of counts.
Binomial STV, explained in two booklets, is just first order binomial STV. (That is symbolised by STV^1. But, for purposes of holding elections, it is not necessary to know about higher orders of binomial STV, based on the binomial theorem.)

Descending from FAB STV, to a basic form of Binomial STV, gave-up a modicum of accuracy, to achieve much greater simplicity.

Traditional hand counted STV has been producing reliable election results for over a century. Binomial STV could adopt that advantage. But traditional counts don’t have the advantage of binomial STV, which gives voters the power to exclude, as well as elect, candidates. I believe (first order) Binomial STV to be the best combination of the simplest and most powerful voting method, to elect and exclude candidates.

So far, so good. My first booklet came up with a hand counted binomial STV. Then I realised I had missed a trick. There is an even simpler tradition of hand counting STV, which I hadn’t adopted for binomial STV. Rather than add this simplest method to my first booklet, I decided to write another booklet.

There are several reasons for this. I didn’t want to complicate my first booklet, which is enough to learn, at one go. Essentially, it adopts Gregory method, which is the arithmetic of how to transfer an elected candidates surplus vote, equitably, to all that candidates next preferences.

This second booklet also explains how to adopt Gregory method to binomial STV. But it does this, in the context of a simpler non-arithmetic method of transfering surplus votes to their next preferences. This non-arithmetic method takes a random sample, the size of a candidates surplus vote over their elective quota of votes. The randomness of the sample is what makes it representative of the winning candidates total vote, because it favors no one preference over another.

At Irish elections, the returning officers tumble the ballot boxes, so the ballot papers are tumbled about in the box, in no sort of order. This is to remove the bias that can occur, from any ward accumulating a clump of preferences for one candidate, that may not be representative of the whole district. Taking a sample, from any such clump, might not constitute a representative sample.

The Irish method of counting surplus votes, by taking a representative sample of a winning candidates total vote, is also practised in Cambridge, the home of MIT, the Massachusetts Institute of Technology. Cambridge city elections computerised random surpluses, when they might have eliminated their statistical margin of error, by introducing the more accurate arithmetic methods of Gregory or Meek.

But it goes to show that statistical sampling has such a tolerable margin of error, that they didn't mind incorporating it in the computer count.

The following simple example is of any election that firstly uses the Gregory method or arithmetic method of counting surplus transfers of votes. These transfers involve fractions of a vote, as in table 3A. But the surplus vote, as a representative sample, is always in whole votes, equal to the size of the sample.

26 voters is much too few to sample surpluses from. I guess you would need at least a hundred, probably hundreds, depending on the complexity of the election.

But so you can see what taking a representative sample looks like, I have changed the arithmetically obtained fractional votes into their nearest whole votes, as in table 3B. Suppose these were votes on ballot papers, randomly obtained, to serve as the number of surplus votes, to be transfered to their next preferences.

In the Irish method, there is no need to do any arithmetic, like the Gregory method. Whole numbers of surplus votes, to their next preferences, are obtained instantly, by drawing a sample of ballot papers randomly, from an elected candidates total transferable vote.

Binomial STV with Gregory method surplus transfers

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The first step in an election count is to count the total number of valid votes. Some of them may be spoiled ballot papers. The next step is to count the numbers of first preferences for each candidate.

Table 1 was originally invented merely to prove a point, which is why it is an unrealistically simplified example of preference distribution. It contains only five permutations of preference. Four candidates have factorial four, which equals 24 permutations of preference. You would expect the voters to come-up with more than five of them, in a real election.

Table 1.
voters orders of choice

votes	1st	2nd	3rd	4th
9	W	Z	X	Y
6	X	Y	Z	W
2	Y	X	Z	W
4	Y	Z	X	W
5	Z	X	Y	W

Table 2 counts the first preferences in table 1. 26 votes for two seats gives a quota of: 26/(2+1) = 9, rounded up to the nearest whole number. No candidate receives more than the quota. Therefore there are no surplus votes to transfer to next preferences.

Table 2.
STV^1 election count.

Candid -ates.	1st prefs.	keep values.
W	9	9/9 = 1
X	6	9/6 = 1.5
Y	6	9/6 = 1.5
Z	5	9/5 = 1.8
votes:	26	

Unlike table 2, the election count, in table 3A, the exclusion count has surplus votes to transfer. This means that a candidate, W, has more than a quota of unpopularity

Table 3A
STV^1 exclusion count.

Cand,	Last prefs.	keep value	W surplus transfer @8/17	post-transfer keep value
W	17	9/17	9	0.529
X			4x8/17 = 1.882	4.782
Y	9	1	9+ (5x8/17) = 11.353	0.793
Z			8x8/17 = 3.765	2.390
tot	26		26	

In table 4, dividing the exclusion keep values into the election keep values is shorter than inverting the exclusion keep value and multiplying by the election keep value. Either way, their square root must be taken, to complete taking the geometric mean keep value of the election and exclusion keep values. This is the over-all keep value.

Table 4.
STV^1 final keep values.

Cand.	Elect keep value	Exclude keep value	√(Elect/ Exclude) keep value
W	1	0.529	1.375
X	1.5	4.782	0.560
Y	1.5	0.793	1.375
Z	1.8	2.390	0.868

The two candidates, X and Z, with final keep values of less than unity are elected to the two available seats.

Binomial STV with Surplus Transfers by Representative samples of Next Preferences

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The above example used a standard statistical technique of weighting in arithmetic proportion, or Gregory method, to transfer a surplus value of votes to their next preferences. We now use the non-arithmetic statistical method of transfering a surplus value, by randomly picking a representative sample of next preferences.

Table 1.
voters orders of choice

votes	1st	2nd	3rd	4th
9	W	Z	X	Y
6	X	Y	Z	W
2	Y	X	Z	W
4	Y	Z	X	W
5	Z	X	Y	W

Table 2.
STV^1 election count. No surplus transfers.

Candid-ates.	1st prefs.	keep values.
W	9	9/9 = 1
X	6	9/6 = 1.5
Y	6	9/6 = 1.5
Z	5	9/5 = 1.8
votes:	26	

Table 3B differs from Table 3A, because I have pretended that there was a random draw ("by lot") of ballot papers. That's why the W surplus transfer column is now in whole numbers. In actual fact, I merely changed the fractional numbers to their nearest whole numbers. An actual draw most likely would not be so accurate a reprsentation. But with sufficiently large numbers of voters, a random draw would usually be near enough. This fact is sometimes known as the law of large numbers.

Table 3B:
Surplus transfer by random samples of preferences
STV^1 exclusion count.

Cand,	Last prefs.	keep value	W surplus transfer (as if) by lot	post-transfer keep value
W	17	9/17	9	0.529
X			2	4.5
Y	9	1	9+2 = 11	0.818
Z			4	2.25
tot	26		26	

Using whole numbers of transfered votes alters the final keep values slightly, but not the result of X and Z being elected.

Table 4.
STV^1 final keep values.

Cand.	Elect keep value	Exclude keep value	√(Elect./ Exclus.) keep value
W	1	0.529	1.375
X	1.5	4.5	0.577
Y	1.5	0.818	1.354
Z	1.8	2.25	0.894

Note on statistical sampling

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The only conditions to statistical sampling are that the sample must be random, and of a certain minimum size. So, you are talking about hundreds of voters, with candidates, whose surplus votes should be 30 or more voters. This is so that the random sample, the size of the surplus, can be a discernible model of the winning candidates whole vote, which is technically called the “population” from which the sample is taken.

Sample and population should have proportionally matching distributions.

This distribution is so common that Francis Galton called it the normal distribution, which is a random distribution. It graphs as the famous bell-shaped curve, which signifies that the average is the norm, and the extremes. at either wing, of much less significance.

Statistical tests, that depend on the presence of random distributions, are called parametric statistics. They cannot be conducted with small numbers of voters, or any other populations, too small to form a normal distribution or recognisable bell-shaped curve. There are (less powerful) non-parametric statistical tests for small populations.

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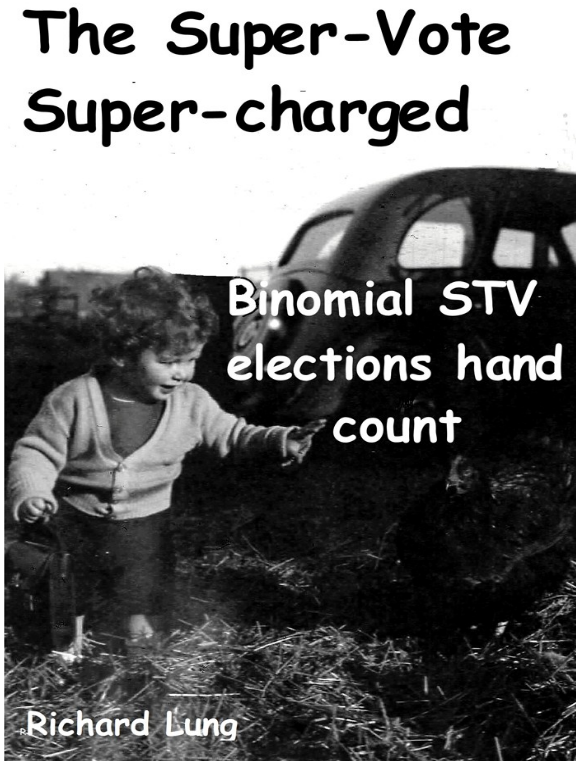

FAB STV:
Four Averages Binomial Single Transferable Vote

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